DESCRIPTIONS OF NEW SPECIES OF RECENT UNSTALKED CRINOIDS FROM THE COASTS OF NORTHEASTERN ASIA.

By Austin Hobart Clark,
Of the United States Bureau of Fisheries.

In a previous paper[a] I published preliminary descriptions of new species of unstalked crinoids belonging to the genus *Decametrocrinus* and the Elegans, Eschrichtii, and Tenella groups of the genus *Antedon*, from the collections made by the U. S. Fisheries steamer *Albatross* in the north Pacific and in the Japanese seas. In the present paper are included the new species belonging to the Basicurva, Spinifera, and Palmata groups of the genus *Antedon*, together with the bidistichate representatives of the Acœla group (which are here referred to as comprising the Multicolor group), the species lacking the pinnule of the third brachial, a species in which the first pinnule is the longest, and another species of the Elegans group. Three new species of *Comatula* are also described, and a species of *Comatula* and another of *Atelecrinus* are renamed. Attention is called to the varied and handsome coloration of the Multicolor group in life, a group in which this feature appears to attain its maximum so far as the Crinoidea are concerned. *A. rubroflava* is very handsome, bright yellow, banded with equally bright red, each color occupying areas about half an inch wide; this is the only species I have seen alive with this type of coloration; but a specimen of *A. stylifer* taken at Kagoshima in 1859 still shows evidence of having been similarly colored, although the specimen of the latter which I obtained is entirely different. The species described in this paper will be described in more detail and figured later. The keys preceding the descriptions are based on those of Dr. P. H. Carpenter, so far as possible; but all the species described since the publication of the *Challenger* report have been taken into consideration, and the characters of the new species here described are presented in such a way that their relations to those previously known will, it is hoped, be perfectly clear.

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[a] Proc. U. S. Nat. Mus., XXXIII, pp. 69-84.

KEY TO THE SPECIES DESCRIBED.

A. Ten-armed species, with the disk and ambulacra plated, but the rays not wall-sided; the pinnules stiff and rod-like .... [Acœla group].

a. First radials produced anteriorly, separating the second radials; second radials and axillaries rounded and widely separated .... (29) *Antedon thetis.*

aa. The radials have flange-like lateral processes, which are in apposition laterally .... (4) *A. separata.*

B. Bidistichate species, with the disk and ambulacra plated, but the rays not wall-sided; the pinnules stiff and rod-like .... [Multicolor group].

a. First radials anchylosed, forming a radial cup with interradial processes reaching to the disk and widely separating the rounded second radials; 15 cirri of 35 joints .... (1) *A. multicolor.*

aa. First radials not anchylosed; interradial processes very narrow, lower part of second radials meeting above them; larger part of the second radials and the axillaries widely separated laterally: 20–25 cirri of 45 joints. (2) *A. versicolor.*

aaa. First radials appear as small interradial triangles with no distal process; second radials in apposition for entire lateral edge, but axillaries widely separated .... (3) *A. propinqua.*

aaaa. The radials have flange-like lateral processes, which are in apposition laterally.

b. Lower brachials (and distichals when present) rounded, and widely separated from those on adjacent rays .... (4) *A. separata.*

bb. The first distichals have flange-like processes, and are in apposition laterally.

c. Cirri short, with 30 short joints; the second or third (or both) pairs of pinnules much elongated; first radials only just visible. (5) *A. flavopurpurea.*

cc. Cirri long and slender, with 40 elongated joints; the proximal pinnules not elongated; first radials large and prominent .... (6) *A. callista.*

C. Ten-armed species, in which the radials and lower brachials have flattened sides. [Basicurva group.]

a. Pinnule ambulacra plated.

b. The later cirrus joints have dorsal spines.

c. First pinnule smaller than the second; cirri three-fourths length of arms, with 80 joints; dorsal surface of radials smooth .... (7) *A. anthus.*[a]

cc. First pinnule nearly or quite as long as the second; cirri longer than the arms, with about 110 joints .... (8) *A. macropoda.*[a]

ccc. First pinnule longer than the second.

d. Over 60 cirrus joints.

e. First pinnule much flattened exteriorly; cirri very slender, with about 70 joints; radials and brachials strongly carinate; arms compressed, with prominent overlapping spines .... (9) *A. hana.*

dd. 30 to 50 cirrus joints.

e. First pinnule flattened on outer side; much larger and stouter than second.

f. Cirri in 15 vertical rows; radials and lower brachials thickly set with short spines .... (10) *A. villosa.*[a]

ff. Cirri in five well-separated double vertical rows; radials and lower brachials bordered with stout spines .... (30) *A. hawaiiensis.*[b]

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[a] Also a bidistichate species; see p. 129.

[b] Also a tridistichate species.

ee. First pinnule not flattened on outer side; cirri in 10 vertical rows.

f. 20 cirri; calyx and arm bases smooth.................. *A. latipinna.*[a]

ff. 30 cirri; calyx and arm bases spiny .... (11) *A. pubescens.*

bb. Less than 30 cirrus joints, without dorsal spines.

c. Pinnules of eighth and following brachials have broad lower joints and strong plates covering the genital glands.

d. Third and fourth joints of genital pinnules broad and nearly flat on the outer side, but the fifth joint smaller.

e. First radials visible; arm bases smooth; 7–10 cirrus joints. (12) *A. hepburniana.*

dd. Lower joints of genital pinnules uniformly expanded.

e. First radials concealed; less than 20 cirrus joints.

f. Calyx and arm bases rugose; first pinnule flagellate, with 40 or more joints .... (13) *A. lata.*

ff. Rays separated laterally; radials scale-like, with a thin marginal flange; second radial hemispherical .... (14) *A. scalaris.*

cc. Pinnules of tenth and following brachials have the lower joints as long as or longer than wide, with no extensive plating over the genital glands.

d. Basals prominent; radials long, not carinate......... (15) *A. garrettiana.*[b]

dd. Basals, first radials, and often more or less of the second radials concealed; cirri stout and rounded basally, slender and compressed distally.. (16) *A. orion.*

aa. Pinnule ambulacra not plated.

b. Three radials visible; stoutest pinnule on second brachial; 30–40 rather elongate cirrus joints.................................. (17) *A. minor.*

D. Bidistichate species with the radial axillaries and some of the following joints more or less wall-sided, and a well-marked ambulacral skeleton on the pinnules .... [SPINIFERA group].

a. Over 30 cirrus joints, the later ones spiny.

b. The first pinnule much smaller than the second; less than 20 cirri in five well-separated double rows; arms long and slender, with more than 100 joints; cirri long and rather stout, with about 80 joints..... (7) *A. anthus.*

bb. The first pinnule about the same length as, or only slightly shorter than, the second; cirri longer than the arms, stout, with about 110 joints. (8) *A. macropoda.*

bbb. The first pinnule as long as or longer than the second; cirri shorter than the arms.

c. Centro-dorsal conical or shortly columnar, with 5 double rows of cirrus sockets.

d. 20 arms of sharply carinate joints.

e. 70–90 slender cirrus joints.......................... *A. quinquecostata.*[a]

ee. 50–55 stout cirrus joints........................... (18) *A. diadema.*

dd. 20 arms of rounded joints; radials not carinate; surface of radials and lower brachials smooth; first pinnule not much stouter than succeeding; 35–40 cirrus joints.............................. (19) *A. aster.*

ddd. Less than 15 arms of rounded joints; radials not carinate; surface of radials and lower brachials covered with spines; first pinnule much larger and stouter than the succeeding; 50 cirrus joints. (10) *A. villosa.*

dddd. Less than 15 arms of rounded joints, but radials strongly carinate; 30 cirrus joints............................... (20) *A. alboflava.*

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[a] Inserted for comparison.

[b] Also a bidistichate species; see p. 130.

aa. Less than 25 cirrus joints, usually smooth.
  b. Centro-dorsal conical, the cirri in 5 radial clusters; cirri rather slender, with 16 smooth joints; basals and first radials large and prominent. (15) *A. garrettiana.*
  bb. Centro-dorsal discoidal, the marginal cirri without definite arrangement; basals and first radials concealed; radials narrow, rounded or flattened; cirri stout and rounded basally, slender and compressed distally. (16) *A. orion.*

E. Ten-armed species with no pinnule on the third brachial.
a. First pinnule the longest.......................................(21) *A. ruber.*
aa. First two pinnules about equal, or the first slightly shorter than the second; long conical processes at the junctions of the two outer radials and first two brachials.......................................(22) *A. diomedeæ.*
aaa. Second pinnule much elongated, the joints with serrate ends; radials and lower brachials smooth, not tubercular ....(23) *A. tigrina.*

F. Ten-armed species with the first pinnule the longest.
a. About 30 smooth cirrus joints, the basal ones elongate........(24) *A. bowersi.*

G. Bidistichate species with an unplated disk and no definite ambulacral skeleton; the sides of the lower brachials are scarcely, if at all, flattened; the first pinnule smaller than its successors ....[PALMATA group].
a. The third brachial has a pinnule.
  b. One post-radial axillary; the rays quite free laterally.
    c. 40–45 cirrus joints; lateral flange-like processes on the radials and distichals. (25) *A. abbotti.*
  bb. One post-radial axillary, the radials and distichals in close contact laterally. (26) *A. stylifer.*
  bbb. Two or more post-radial axillaries.
    c. Third pinnule larger than the second.
      d. Cirri not spiny.
        e. Cirri elongate, with 40 or more joints ....(27) *A. delicatissima.*

H. A syzygy in the radial axillary.. ....[ELEGANS group].
a. Cirri very stout, the joints about as broad as long; there are no dorsal spines, but the penultimate joint bears a strong opposing spine; second radials visible (11 arms in the type) ....(28) *A. rubroflava.*

1. ANTEDON MULTICOLOR, new species.

Centro-dorsal a thick disk, bearing 15 cirri in a single marginal row; these are 20 mm. long with about 35 short joints, of which the sixth and seventh are squarish, the others wider than long; the joints overlap somewhat and distally bear small dorsal spines.

First radials completely anchylosed laterally, extending up in a tongue-like process in each interradial area to the disk, thus widely separating the second radials; second radials oblong, slightly over twice as wide as high; axillaries pentagonal, slightly less than twice as wide as high. Axillaries and second radials of each ray rounded and widely separated from those of adjacent rays; the lower part of the calyx bears a strong resemblance to that of *Atelecrinus balanoides;* but the "basal ring" in the case of *Antedon multicolor* is formed of the coalesced first radials, consequently there are only two radials above it, whereas in *Atelecrinus* there are three. The articulation between the two outer radials in *Antedon multicolor* is of such a character as to almost appear syzygial, and the two joints are entirely incapable of motion on one another; but the articulation between the first and second radials admits of a very considerable dorso-ventral motion. Judging from Dr. P. H. Carpenter's figure of *Atelecrinus balanoides*, a similar condition appears to occur in that species. Distichals two, resembling the two outer radials, but higher in proportion to their width; 20 arms 60 mm. in length with about 75 brachials, quadrate proximally, becoming triangular, about as high as wide, about the tenth or eleventh. The longer edges of all the brachials are convex and bear a pinnule in the center. The second brachial is considerably swollen on the side bearing the pinnule. Syzygies occurs in the third brachial, again about the tenth or twelfth, and distally at intervals of 2, sometimes 3, joints.

First pinnule short and very slender, flexible, with 19 joints, the first two enormously expanded, the remainder very small and squarish; second pinnule usually more than twice its length, stiff, stout, and rod-like, with 15–20 joints, the first two much expanded, the remainder elongate. The length of the second pinnule is very variable even in a single specimen; the second pinnule on one arm may be half as long again as that on another, or one of the second pair may be much longer and stouter than its fellow; however, the second pinnule is always much longer than the first, and always stiff and spine-like, while the first is weak and flexible. The third pinnule is usually considerably smaller than the second, though similar in character, and from then on the length gradually diminishes to the seventh or eighth, after which they remain very uniform to the ends of the arms. The enlargement of the two lower joints, which is greatly exaggerated on the first pinnule, is much less marked on the second, still less on the third, and hardly noticeable after the fourth.

The color in life is usually a delicate light grayish purple, or lavender, with narrow bands of dull yellow on the arms; one specimen, however, is pure white, the arms crossed by a broad, deep purple band near the middle and another near the tip. The cirri are light lavender, usually with a narrow band of yellow about the end of each joint.

This small group, of which *A. multicolor* is the type, illustrates better than any other with which I am acquainted in life the utter worthlessness of color as a specific character among many of the unstalked crinoids. All but one of my specimens were lavender, narrowly banded with dull yellow; this is the color of all my examples of *A. flavopurpurea* except three, which are a beautiful orange yellow, becoming bright orange on the rays and centro-dorsal; it is also the color of *A. delicatissima* of the *Palmata* group, most closely related to *A. bimaculata* Carpenter, which is dark purple up to the last axillary, then white; but this last type of coloration also occurs in *A. manca* (=*A. disciformis*=*A. claræ*), a species widely different from *A. bimaculata* and usually dull white, spotted more or less thickly with grayish or reddish purple, resembling some color phases of *A. diomedeæ*. One specimen of *A. multicolor* is white, with purple bands, almost exactly like the type of *A. callista*. *A. versicolor*, which is most nearly allied to *A. multicolor*, is reddish brown, resembling species of the *A. palmata* group, but quite different from any known form of coloration in its own group. *A. propinqua*, also, which is reddish brown marbled with white, is quite different from any others in the group.

Type.—Cat. No. 22619, U.S.N.M.; from *Albatross* station No. 4894; 32° 33′ 00″ north latitude, 128° 32′ 10″ east longitude (Eastern Sea); 95 fathoms; August 9, 1906.

2. ANTEDON VERSICOLOR, new species.

Centro-dorsal a low disk, bearing 20–25 marginal cirri; these are moderately stout, 23 mm. long, composed of 45 short, squarish joints, overlapping somewhat, and bearing spines distally.

First radials visible as triangles in the interradial areas, the distal apices much produced; the sutures between the first radials are distinctly visible; second radials oblong, between three and four times as wide as high, bluntly carinate, in apposition basally, free distally; axillaries widely pentagonal, twice as wide as high, bluntly carinate in their posterior half, widely separated; distichals like the two outer radials, but rather higher in proportion. Twenty arms 90 mm. long with 130 brachials, the first 5 irregularly oblong, then quadrate to the twelfth, after which they become triangular, about as high as wide, the long outer side convex and bearing the pinnule at its distal apex; brachials strongly overlapping, slightly compressed and slightly carinate; first syzygy in the third brachial, another about the eighteenth, and others distally at intervals of one, two, or three joints.

First pinnule about 7 mm. long, slender, delicate, and flexible, with 30 joints, the first enormously expanded, the second very broad and trapezoidal, the others very small and square; second pinnule 10 mm. long, stiff and spinelike, with 25 joints, the first two much enlarged, the remainder elongated; third pinnule 13 mm. long, resembling the second, but with the joints more elongate; fourth similar, but slightly shorter; the following pinnules decrease in length to about the ninth, which is 7 mm. long with 15 joints, the first two broad, the others elongated, after which there is a slight increase in length distally; the distal expansion of the first joint is marked on all the pinnules, but less so distally; on most of the pinnules after the fifth it rises into a low tubercle.

Color in life rich, deep purplish brown, the basal portion of the arms with a row of lateral yellow spots; rays yellow, transversely banded with purplish brown; cirri purplish brown, with the distal half yellow; disk purplish brown, marbled with yellow in the interambulacral areas.

Type.—Cat. No. 22620, U.S.N.M.; from *Albatross* station No. 4884; 32° 32′ 00″ north latitude, 129° 30′ 45″ east longitude (Eastern Sea); 53 fathoms; August 8, 1906.

3. ANTEDON PROPINQUA, new species.

Centro-dorsal discoidal, bearing 25 marginal cirri in two alternate rows; cirri 25 mm. long, moderately slender, with 45 joints, the basal half of which are rather longer than wide, the distal half bearing strong dorsal spines.

First radials visible as a low interradial triangle with no apparent median suture; second radials low and wide, their lateral edges produced into flangelike marginal processes which meet those of the adjacent second radials, so that the second radials are all in apposition for their entire length; axillaries pentagonal, with the lateral edges produced, but entirely free; the two distichals resemble the two distal radials, but their sides are rounded without lateral processes, and they are proportionately higher. Twenty arms, 70 mm. long, with about 120 joints, of which the basal 3 are roughly oblong, then quadrate to the tenth or eleventh, then triangular, about as long as wide; the long sides of all are convex, bearing the pinnule at the distal apex.

The first pinnule is very small, delicate, and flexible, with 20 joints, the first enormously enlarged, the second less than half as large, the remainder very small and squarish; the second pinnule is much longer and stouter, stiff and rod-like, with about 15 joints, the first short and broad, the second squarish, the remainder much elongated; the third pinnule is even longer and stiffer, after which the pinnules gradually decrease to about the eighth, then increase very slightly distally.

Color in life reddish and purplish brown marbled with light yellow, the dark and the light in about equal proportions; rays and lower brachials purple, with a medium line of white; two or three areas of white with purple spots distally on the arms.

Type.—Cat. No. 22621, U.S.N.M.; from *Albatross* station No. 4895; 32° 33′ 10″ north latitude, 128° 32′ 10″ east longitude (Eastern Sea); 95 fathoms; August 9, 1906.

4. ANTEDON SEPARATA, new species.

Centro-dorsal rounded-discoidal, bearing about 15 cirri in two irregular rows; these are 15 mm. long, with 35 joints, of which about one-half are slightly longer than wide and the distal two-thirds bear dorsal spines.

First radials narrow and band-like; second radials short, oblong; axillaries low and wide, pentagonal; the two last usually have the lateral edges more or less produced and flangelike and in apposition.

Seven of the specimens have 10 arms only, two have 11, and one has 12; arms 55 mm. long, with 85 brachials, the first 5 quadrate, then triangular about as long as wide, becoming quadrate and elongate distally; the long sides of the joints are convex, and bear the pinnules in the distal angles.

First pinnule small, slender, and delicate, the first two joints greatly enlarged, the others small and squarish; second pinnule much longer with elongated joints, the pinnules from then on remaining very uniform to the end of the arm, the second and third being only very slightly or not at all longer than the succeeding.

Color in life bright yellow, banded with purple; lower brachials purple; cirri deep purple, or purple banded with white.

Type.—Cat. No. 22622, U.S.N.M.; from *Albatross* station, No. 4893; 32° 32′ 00″ north latitude, 128° 32′ 50″ east longitude (Eastern Sea); 106 fathoms; August 9, 1906.

5. ANTEDON FLAVOPURPUREA, new species.

Centro-dorsal low-hemispherical, the pole somewhat flattened, bearing about 20 marginal cirri in two irregular rows; the cirri are 15 mm. long and have 30 rather stout joints, the first 10 slightly longer than wide, the others short; all the joints are slightly compressed and have expanded and overlapping distal edges, and the distal two-thirds are provided with a dorsal spine, which becomes more prominent toward the tip; penultimate joint and terminal claw rather small.

First radials just visible, not produced anteriorly; second radials oblong, terminating laterally in a tubercle, and furnished with a strong median keel; axillary triangular, about twice as wide as high, with a median tubercle just forward of the center, continued backward in a keel, corresponding with the keel on the second radial; surface of second radial and axillary rough, and furnished with a few small blunt tubercles. Two articulated distichals, the first irregularly oblong, slightly raised in the center, furnished exteriorly with a broad lateral flange, the axillary triangular, a low tubercle on its lower margin. Usually 20 arms of about 120 joints, the first 5 irregularly oblong, then triangular to about the middle of the arm, about as high as wide, then becoming quadrate; all the brachials have overlapping edges, the lower ones furnished with a row of fine sharp teeth. A syzygy in the third brachial, another about the fourteenth, and others at intervals of about 4 joints.

The first pinnule is small, slender, and delicate, 4 mm. long, with 15 joints, the first 2 disproportionately large, the others longer than wide; second pinnule 6 mm. long, with 15 joints, the first 2 enlarged, the rest elongate; the third pinnule is 7 mm. long and resembles the second. The following pinnules decrease gradually in length to the seventh or eighth, which are 4.5 mm. long, with about 10 joints, then gradually increase distally, where they are 6 or 7 mm. long, with 12–15 joints. The pinnules from about the tenth to the twenty-fourth brachials have the first 5 or 6 joints somewhat, though not greatly, expanded.

Color in life, lavender, the arms crossed by bands of dull yellow; cirri yellow; lower pinnules yellow, banded at the junction of alternate joints with purple. Other specimens are similar, but the rays and centro-dorsal orange, the cirri purple. Another type of coloration is: rays and centro-dorsal orange, the arms clear yellow, sometimes faintly blotched with light purple; cirri deep purple, banded with white.

Type.—Cat. No. 22623, U.S.N.M.; from *Albatross* station, No. 4935; 30° 57′ 20″ north latitude, 130° 35′ 10″ east longitude (off Kagoshima Gulf); 103 fathoms; August 16, 1906.

6. ANTEDON CALLISTA, new species.

Centro-dorsal short-columnar, bearing about 30 cirri in two rows; these are 23 mm. long, slender, with about 40 joints, most of which are longer than wide, the lower ones very much so; the distal two-thirds bear dorsal spines.

First radials comparatively large from one-half to nearly the whole height of the second radials in the median line, not produced interradially, in apposition all around, the sutures almost obsolete; second radials low and wide, about four times as broad as long, roughly oblong, the edges in apposition laterally; axillaries triangular or low pentagonal, about twice as wide as high; radials and axillaries bluntly carinate; distichals (when present) 2, like the two outer radials, but the first distichal has a broad lateral flange on its outer side. Fifteen arms 70 mm. long, the first two brachials oblong, then quadrate to the eighth, then triangular, about as long as wide; the brachials in the proximal half of the arm are somewhat tubercular; syzygies in the third brachial, the eighth to twelfth (usually the eighth), and distally at intervals of 2 or 3 joints.

First pinnule 5 mm. long, very slender and delicate, the first two joints greatly expanded, the remainder short and squarish; second pinnule 6 or 7 mm. long, with 20 joints, the first expanded, the next two short, the remainder elongated. The following pinnules decrease very slightly in length as far as the basal third of the arm, then increase very slightly distally. The expansion of the proximal pinnule joints is not marked after the first three.

Color in life, white, a broad band of deep purple in the basal third of the arm, and two or three narrower bands distally.

Type.—Cat. No. 22624, U.S.N.M.; from *Albatross* station, No. 4903; 32° 31′ 10″ north latitude, 128° 33′ 20″ east longitude (Eastern Sea); 139–107 fathoms; August 10, 1906.

7. ANTEDON ANTHUS, new species.

Centro-dorsal long and columnar, terminating in a truncated cone with a shallow central crater having a coarsely papillose border and 5 low interradial ridges. The cirri are very regularly arranged in 10 vertical rows, usually of 2 each; the vertical rows are in pairs, each pair separated from its neighbors by a broad vertical line or shallow groove, radial in position. The cirri are 20 in number, 60 mm. long, with 80 joints of fairly uniform width, but becoming rather narrower distally. The first 6 or 7 joints bear dorsal spines; the following joints are smooth up to about the twentieth, where spines begin again to develop, becoming prominent distally The first 7 or 8 joints are wider than long, then squarish or slightly longer than wide to about the twentieth, then gradually becoming shorter distally.

The ends of the basal rays are just visible as small tubercles at the base of the upper pair of cirri in each interradial area. The radials resemble those of *Antedon longicirra*, but the axillaries are shorter. The radials and first brachials are rounded, but not very convex, and there is no central tubercle as described in *A. longicirra* nor median keel as in *A. macropoda*. The first 7 brachials are short and oblong, the following triangular, wider than high, after the fortieth becoming compressed and carinate and developing a forward projecting dorsal spine. The radials and first 10 brachials have flattened sides. Distichals 2, like the 2 outer radials. A syzygy in the third (in one case the fourth) brachial, again in the eighth–fourteenth, and distally at intervals of 2–5 (usually 2) joints. The arms are 13 in number, 80 mm. long.

First pinnule comparatively short, with 9 joints, stout basally, tapering to a point. Second pinnule more than half as long again, with 12 joints; third pinnule about the same, or slightly shorter; the next 2 or 3 are very slightly shorter, the length then increasing distally. All the pinnules are flattened on their outer sides, with their distal edges sharply carinate.

Color in life, dull brownish yellow, the cirri almost white.

Type.—Cat. No. 22625, U.S.N.M.; from *Albatross* station No. 4936; 30° 54′ 40″ north latitude, 130° 37′ 30″ east longitude (off Kagoshima Gulf); 103 fathoms; August 16, 1906.

8. ANTEDON MACROPODA, new species.

Centro-dorsal columnar, the terminal portion conical, ending in a rosette of 5 tubercles, radially situated. Cirri about 15 in number, somewhat longer than the arms, 100 mm. in length, situated in 10 rows very close together, not separated off into pairs, as in *Antedon anthus*, one, sometimes two, in each row; cirri with 100–120 joints, those in the proximal half but slightly, if any, longer than wide, those in the distal half short; the cirri are broadest in the distal third; terminal claw very small; there are no dorsal spines on the proximal joints, and the distal dorsal spines are not so prominent as in *A. anthus*.

Basals visible as a more or less prominent interradial tubercle.

First radials short; second radials rather large; axillaries triangular or pentagonal, rather low; the radials are carinate, usually rather strongly; distichals (when present) 2, resembling the two outer radials, but rather higher in proportion to their width. Ten to twelve arms, 95 mm. long, of more than 100 joints, at first oblong, rather short, becoming triangular, wider than long after about the ninth, and about the middle of the arm becoming laterally compressed and developing strong forward-projecting median spines. The last four or five joints are very short, high, and compressed, bear no pinnules, and are strongly curved inward, giving the appearance of the arm having been broken off at the tip, as the distal pinnules exceed the arm joints by 3 or 4 mm. A syzygy in the third brachial, another in the ninth–eleventh, and others distally at intervals of 4 or 5 joints.

The pinnules are styliform and very stiff, like those of *A. anthus;* the first pinnule consists of 13 joints, and is only slightly, when at all, shorter than the second, which consists of 10. The remaining pinnules are very uniform in length, and have about 15 joints; all are strongly carinate.

Color in life light brownish-yellow, cirri white.

Type.—Cat. No. 22626, U.S.N.M.; from *Albatross* station No. 4935; 30° 57′ 20″ north latitude, 130° 35′ 10″ east longitude (off Kagoshima Gulf); 103 fathoms; August 16, 1906.

9. ANTEDON HANA,[a] new species.

Centro-dorsal small, hemispherical, divided by 5 interradial lines into trapezoidal areas, each with 2 rows of cirri of 2 each, making 20 in all. Cirri 45 mm. long, slender and much compressed, with 65–75 short joints, basally slightly longer than wide, becoming wider than long after about the twenty-fifth, the joints distally developing sharp dorsal spines.

First radials crescentic, very narrow, with a fringe of teeth along the superior border; second radials narrow, very deeply incised by the axillaries, and furnished with teeth along their entire edge; axillaries slightly wider than long, with a high median keel in the posterior half. Ten arms, 60 mm. long, with about 100 joints, the first 8 roughly oblong with strong lateral processes and a blunt median keel, overlapping in a short spine anteriorly, the succeeding joints quadrate, much compressed, with a sharp median keel and long overlapping spine.

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[a] From the Japanese word *hana*, signifying flower.

First pinnule the longest, about 5 mm. long with 8–10 stout squarish joints, the first much expanded; following pinnules decrease in length to the fifth, after which they gradually increase distally, becoming much more slender, reaching a length of 8 mm. with 15–18 joints. The radials, first 3 or 4 brachials (including the first two pinnules), are flattened laterally.

Color in life bright yellow, sometimes banded with white; cirri white, with a few narrow bands of yellow.

Type.—Cat. No. 22632, U.S.N.M.; from *Albatross* station No. 4903; 32° 31′ 10″ north latitude, 128° 33′ 20″ east longitude (Eastern Sea); 139–107 fathoms; August 10, 1906.

10. ANTEDON VILLOSA, new species.

Centro-dorsal bluntly conical, the cirri arranged in 15 vertical rows, 3 in each interradius, 2 or 3 cirri in each row, making 40–45 in all; the cirri about the basal part of the centro-dorsal are 33 mm. long with 50 joints, the fourth–eleventh longer than wide, the remainder rather short; all but the basal 6 or 7 bear dorsal spines, which become more prominent distally; the apical cirri are usually somewhat shorter and stouter, with 30–40 joints; the bare apical portion of the centro-dorsal has 5 interradial ridges, and is thickly covered with fine hair-like spines.

The basals are visible as small tubercles at the angles of the calyx; first radials just visible, very narrow and crescentic; second radials short, about three times as wide as high; axillaries widely pentagonal, and wider than high. Ten (in one example eleven, bidistichate) arms 95 mm. long, with 90–110 joints, the first 10 oblong, then quadrate, becoming more elongate distally; a syzygy in the third brachial, another about the sixteenth or eighteenth, and others distally at intervals of 4–8 joints.

First pinnule 10 mm. long, very stout, with 20 short joints, tapering gradually from the base to the tip, and flattened on the outer side; second pinnule 7 mm. long, with 15 joints, much more slender than the first; the following pinnules about 6 mm. long, with 13 or 14 joints; distal pinnules 14 mm. long, stout, carinate, with about 22 joints, the basal half of which are squarish, the rest elongate; pinnule ambulacra plated. The radials and 4 or 5 lower brachials are thickly set with fine hair-like spines; pinnule joints strongly overlapping and with the distal edges set with spines; arm joints with both the proximal and distal edges turned outward and furnished with spines.

Color in life bright yellow, the centro-dorsal, radials, and lower 4 or 5 brachials dark greenish; cirri yellow.

Type.—Cat. No. 22630, U.S.N.M.; from *Albatross* station No. 4780; 52° 01′ 00″ north latitude, 174° 39′ 00″ east longitude (western Bering Sea); 1,046 fathoms; June 7, 1906.

11. ANTEDON PUBESCENS, new species.

Centro-dorsal rather small, bluntly conical, with 10 vertical rows of cirrus sockets, usually 3 in a row; cirri 25 to 30 in number, slender, 30 mm. long, with 50 to 55 joints, the basal 10 or 12 longer than wide, distally developing rather low dorsal spines.

Basals and first radials just visible in the angles of the calyx, the former as small tubercles; second radials short and band-like, sharply carinate, with raised and serrate edges; axillaries low and wide, a sharp keel in the posterior half. Ten arms, 80 mm. long, the first 6 or 7 brachials oblong, the rest quadrate, becoming elongate distally; syzygies in the third brachials, again about the fourteenth, and distally at intervals of 2, 3, or 4 joints.

First pinnule 7 mm. long, with 21 or more short joints, the basal 4 or 5 of which are produced dorsally into a broad thin keel; all the joints have their edges armed with bunches of very fine spines; second pinnule 5 mm. long, with 16 joints, the basal 3 or 4 of which have a thin dorsal keel which, however, is not nearly so wide as that on the first pinnule; the first and second pinnules are somewhat flattened laterally; the three following pinnules are in general similar to the second, but more slender; the next 3 or 4 pairs have the third to sixth joints laterally expanded, covering the genital glands, after which the pinnules become slender and more elongated, reaching a length of 8 mm. with 15 joints.

The radials and lower brachials are covered with numerous and thick-set very fine spines, which become less apparent after about the tenth brachial, after which the joints develop an overlapping border of very fine teeth, and longitudinal striations, which last, on the distal brachials, become more pronounced, and break up on the outer portion of the joints into numerous fine spines.

Color in life, light yellow.

Type.—Cat. No. 22631, U.S.N.M.; from *Albatross* station No. 4919; 30° 34′ 00″ north latitude, 129° 19′ 30″ east longitude (Eastern Sea); 440 fathoms; August 13, 1906.

12. ANTEDON HEPBURNIANA,[a] new species.

Centro-dorsal low-hemispherical with a rough dorsal pole, but without interradial processes, bearing about 10 marginal cirri; these are 7 mm. long, usually in a single row, and consist of about 10 stout joints which do not develop a dorsal spine.

Basals visible as interradial tubercles.

First radials short and band-like, with curved borders, the lateral edges raised into a blunt tubercle; second radials longer, about four times as wide as high, and bluntly carinate; axillaries low and wide, about three times as wide as high, with a blunt median keel; the radials and first 4 or 5 brachials have wall-like sides. Ten arms, 45 mm. long, the first brachials oblong with a blunt median keel, becoming quadrate after the fifth, and more elongate toward the end of the arms; a syzygy in the third brachial, another about the tenth, and distally at intervals of 3 or 4 joints.

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[a] I take great pleasure in dedicating this species to Lieut. Arthur J. Hepburn, U. S. N., to whom is largely due the success attending the recent cruise of the *Albatross* in the north Pacific.

First pinnule 2.5 mm. long, with 10 to 13 short joints, the first 4 or 5 considerably wider than the others; the pinnule on the third brachial is similar, but slightly shorter, with the basal joints not so much enlarged; the second pinnule (fourth brachial) is 2 mm. long, with 6 joints, of which the third and fourth are laterally greatly expanded; the next 5 pinnules are similar, with 6 or 7 joints, and usually the third and fourth, sometimes the third, fourth, and fifth, greatly expanded laterally; distally the pinnules become uniformly tapering and slender, reaching 3.5 mm. in length, with about a dozen joints but little longer than wide.

Color in life, bright yellow.

Type.—Cat. No. 22635, U.S.N.M.; from *Albatross* station No. 4890; 32° 26′ 30″ north latitude, 128° 36′ 30″ east longitude (Eastern Sea); 135 fathoms; August 9, 1906.

This species is related to *Antedon incisa* Carpenter, but differs markedly in the character of the pinnules and cirri, and in the arrangement of the latter on the centro-dorsal.

13. ANTEDON LATA, new species.

Centro-dorsal a thick disk, bearing about 20 robust cirri in two marginal rows; the cirri are 21 mm. long and have 15 short and stout joints, of which the sixth and seventh are the longest, and are slightly longer than wide; the distal joints do not bear spines, but overlap somewhat dorsally.

First radials concealed; second radials and axillaries short and wide, the edges crenulate, a large blunt tubercle occupying the center of each, with several other smaller blunt tubercles about the edges; the radials and first 5 or 6 brachials are wall-sided and in close apposition. Ten arms, 115 mm. in length, the first two brachials very irregularly oblong with large median tubercles and crenulated edges; the third brachial is more regularly oblong, the hypozygal with a row of 4 or 5 small blunt tubercles; the following 7 brachials are irregularly quadrate, their surfaces uneven, but not tubercular; after the tenth the brachials become triangular, slightly wider than high, the edges overlapping somewhat, this condition becoming more prominent distally, where the joints become again quadrate; syzygies in the third brachials, again about the twelfth, and distally at intervals of 7 to 10 joints.

The first pinnules are 10 mm. long, comparatively slender, with about 40 short joints, the basal 8 or 10 flattened exteriorly and rather broad; the pinnule tapers rather gradually from the base to the tip; the second pinnule is much shorter than the first and has about 23 joints, of which the proximal 8 or 9 are much expanded laterally; the third pinnule like the second, but somewhat shorter, the 6 basal joints even more expanded, reaching a maximum on the third or fourth, then tapering toward the tip; following pinnules to the fiftieth brachial similar, but the number of joints increasing from 12 on the fourth pinnule (eighth brachial) to 20 on the pinnule on the fiftieth brachial; as the great lateral expansion is always confined to the first 6 joints (reaching a maximum on the third or fourth, then gradually decreasing to the sixth, which, distally, is of normal diameter) it necessarily follows that the expanded joints covering the genital glands progressively occupy less and less of the pinnule; while in the lower they take up most of its length; in that on the fiftieth brachial they occupy barely the proximal third; distally the pinnules are 11 mm. long, slender, with about 20 elongated joints. The ambulacra are well plated.

Color in life, yellowish brown.

Type.—Cat. No. 22628, U.S.N.M.; from *Albatross* station No. 4918; 30° 22′ 00″ north latitude, 129° 08′ 30″ east longitude (Eastern Sea); 361 fathoms; August 13, 1906.

14. ANTEDON SCALARIS, new species.

Centro-dorsal short-columnar, terminating in a stellate figure with rounded angles and elevated center, bearing about its edges numerous small knoblike tubercles, one at the base of each of the apical cirri. Cirri stout, 20 mm. long, with 15 joints, about 20 in number, irregularly situated in two or three rows, with all of the joints longer than wide, not bearing dorsal spines.

First radials concealed; second radials hemispherical, the curved side down; axillary with the proximal border well rounded, almost a semicircle; the last two joints have their lateral and posterior borders produced into a thin flange; on one of the rays in the type there is a fourth radial, a little more than half the size of the second, interpolated between the second radial and the axillary. Ten arms 110 mm. long, the first two brachials short, their lateral edges produced, the following to the eighth irregularly quadrate, then triangular, as long or rather longer than wide, becoming quadrate at the tips of the arms; a syzygy in the third brachial, another in the eighth–eleventh, and distally at intervals of 2 or 3 joints.

First pinnule 7 mm. long, slender, tapering, and almost flagellate, with 22 squarish joints; second pinnule shorter with 15 joints, the first 7 short and broad, the others very small; following pinnules to the eighth or ninth with 10 joints, of which the third–seventh are bluntly keeled and much expanded dorso-ventrally, and bear a large genital gland, protected with large plates; the terminal joints of these pinnules are minute, the basal not especially stout; the terminal pinnules are 10 mm. long, with 15 moderately elongated joints, the ambulacra well plated.

Color in life yellowish brown.

Type.—Cat. No. 22629, U.S.N.M.; from *Albatross* station No. 4918; 30° 22′ 00″ north latitude, 129° 08′ 30″ east longitude (Eastern Sea); 361 fathoms; August 13, 1906.

15. ANTEDON GARRETTIANA,[a] new species.

Centro-dorsal subconical, bearing about 15 closely set cirri, roughly divisible into 5 radial clusters, indicated by slight dorsal prolongations of the basals; cirri 20 mm. long, with 16 joints, all somewhat longer than wide, sharply carinate dorsally, but without dorsal spines.

Basals prominent, appearing as tubercles between (and below) the first radials.

First radials short, smooth, with a strong, rounded dorsal keel; second radials much longer, between two and three times as wide as high, also with a strong rounded median keel; axillaries widely pentagonal, about twice as wide as high, with a rounded keel extending from the base to the apex of the pentagon; radials and first 3 brachials in close contact all around, and with sharply flattened sides. Eleven arms, 65 mm. long, bidistichate; first 9 brachials discoidal, the first with a strong rounded keel, which soon becomes inconspicuous and disappears altogether on the eighth; succeeding brachials quadrate, becoming elongate toward the end of the arms; a syzygy in the third brachial, another about the thirteenth, and distally at intervals of 6–10 joints.

First pinnule slightly the longest, 6 mm. long, with 20 nearly square joints, the first but little wider than the others, which taper regularly to a point; the following pinnules gradually decrease in length to about the seventeenth brachial, which has a very short pinnule, then increase again distally, where the pinnules are 6 mm. long, moderately slender, with 15 joints.

Color in life, dull yellowish white.

Type.—Cat. No. 22633, U.S.N.M.; from *Albatross* station No. 4894; 32° 33′ 00″ north latitude, 128° 32′ 10″ east longitude (Eastern Sea); 95 fathoms; August 9, 1906.

This species comes nearest to *A. aculeata* Carpenter, from which, however, it is readily distinguished by the presence of prominent basals, the much greater proportionate length of the radials, and the obsolete and faintly indicated carination of the lower brachials.

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[a] For the late Lieut.-Commander Leroy M. Garrett, U. S. N., the commanding officer of the *Albatross* during the recent cruise.

16. ANTEDON ORION, new species.

Centro-dorsal a thick disk, bearing 9–25 (usually about 12–15) smooth cirri, irregularly disposed in one or two rows about the margin. The cirri are 20 mm. long, with 15–25 joints, the distal bearing low spines. The cirri are of peculiar shape; the first 5–7 joints are large and stout, rounded, the first 3 very short and wide, the others longer than wide; the remaining joints are conspicuously less in diameter, compressed, and short; moreover, the stout basal joints are dull greenish in color, and have a dull surface; the slender distal joints are light yellow in color, with a highly polished surface; the transition takes place on a joint shaped like a truncated cone, the distal portion encircled by a raised and highly polished collar; this joint is usually darker in color than those preceding it, and, like them, has a dull surface, except for the terminal collar. In most cases it is very conspicuous.

The disk is moderately but sometimes rather scantily plated; the ambulacra are always well plated.

First radials usually concealed; second radials short and bandlike, bluntly carinate, the edges rough; axillaries triangular or widely pentagonal, always much wider than high, the surface rugose. Distichals two, the first very short, the axillary about as wide as high, almost triangular. Ten to eighteen arms, 140 mm. long; first brachials very short and bandlike; the succeeding brachials to the tenth or twelfth irregularly oblong or slightly quadrate, short, and slightly tubercular; following brachials more distinctly quadrate, soon becoming triangular, the distal edges abruptly turned outward, this condition becoming marked after the tenth, at which point projections in the produced distal edge on alternate sides of the arm begin to appear, which distally draw nearer and nearer in the median line, resulting, after the thirtieth brachial, in a strong median carination, produced distally into overlapping spines, resembling those in *Antedon quinquecostata;* after the thirtieth brachial, too, the arms, which heretofore have been rounded dorsally, become laterally compressed, the diameter decreasing rather suddenly and the arms becoming narrow.

First pinnule the longest, 6.5 mm. long, with 15 short squarish joints, somewhat flattened on the outer side, the basal stout, the distal tapering gradually; second pinnule like the first, but slightly shorter; following pinnules decreasing in length to about the sixth, which is 4 mm. long, with 9 joints, all rather broad except the last two; distally the length increases gradually to 7 or 8 mm., with 18 squarish joints, tapering gradually from the base. All the pinnules are strongly carinate.

Color in life bright yellow, usually banded rather narrowly with white; cirri dull greenish basally, light yellow distally, the colors separated by a darker band. Some specimens, more often the larger ones, are grayish, the distal portion of the arms bright yellow.

Type.—Cat. No. 22627, U.S.N.M.; from *Albatross* station No. 4934; 30° 58′ 30″ north latitude, 130° 32′ 00″ east longitude (Eastern Sea); 152–103 fathoms; August 16, 1906.

17. ANTEDON MINOR, new species.

Centro-dorsal conical, rather long, with 30–40 cirri 15 mm. long with 40–45 joints, the basal half of which are longer than wide, the terminal third with a very slight dorsal spine.

The pinnule ambulacra are not plated.

Three radials visible; the first crescentic and furnished with several large blunt teeth in the middle of the distal edge; the second wide, low, irregularly oblong, furnished laterally with several large blunt teeth, often interlocking with those on the neighboring brachials, and a row of large blunt teeth on the distal edge; axillaries high, produced anteriorly into a sharp angle. Ten arms 50 mm. long; first brachial irregular in shape with a much longer outer than inner edge, and incised by the backward projection of the second brachial, which is irregularly quadrate; third to fifth brachials oblong; following brachials quadrate, about as wide as high, becoming elongate later.

First pinnule with 8 or 10 elongated joints, considerably longer and stouter than its successors, which decrease in length to about the fifth, then gradually increase distally, where they are about 6 mm. long with 12 joints, the first 2 expanded and trapezoidal, the others elongated and slender.

Color in life light yellow.

Type.—Cat. No. 22638 U.S.N.M.; from *Albatross* station, No. 4965; 33° 35′ 20″ north latitude, 135° 10′ 50″ east longitude (off southern Japan); 191 fathoms; August 28, 1906.

This species is nearest to *Antedon pusilla* Carpenter, but it differs in the much more numerous cirri, which are longer and more slender with a much greater number of joints, in the character of the centro-dorsal, which is conical and usually rather long instead of low-hemispherical, and in the aspect of the radials, which are markedly longer.

18. ANTEDON DIADEMA, new species.

Centro-dorsal long and columnar, the tip conical, bearing about 20 slender cirri in 10 rows of 2 each, those of one row alternating in position with those of the adjacent rows; cirri 25 mm. long with 50–55 joints, the basal half elongate, the distal short with prominent dorsal spines.

Basals just visible as small interradial tubercles.

Radials rather long, the first and second about the same size, the axillary widely pentagonal, broader than high, the axillary and second radial with a high and sharp median keel; distichals two, like the two outer radials, and with a prominent keel; 11 to 18 arms, 30 mm. long (only one-fifth longer than the cirri), the first 8 brachials oblong, rather long, then becoming quadrate; all the brachials are strongly carinate and compressed, the arms becoming very narrow after the basal third, where the brachials begin to develop overlapping dorsal spines.

First pinnule considerably the largest, with 8 or 10 elongated joints; the following pinnules decrease in length to the fifth or sixth, then increase again slowly distally.

Color in life bright yellow.

Type.—Cat. No. 22637, U.S.N.M.; from *Albatross* station, No. 4934; 30° 58′ 30″ north latitude, 130° 32′ 00″ east longitude (off Kagoshima Gulf); 152–103 fathoms; August 16, 1906.

19. ANTEDON ASTER, new species.

This species is nearest to *Antedon quinquecostata* Carpenter (=*A. conifera* Hartlaub), of which I have 7 Japanese examples for comparison; but the cirri are shorter and proportionately stouter, with 35–40 joints, the radials and brachials are rounded and not compressed, the former with their edges armed with fine teeth, the distal brachials strongly overlapping, the distal half as well as the distal edge of each joint beset with numerous fine teeth.

Color in life bright yellow.

Type.—Cat. No. 22636, U.S.N.M.; from *Albatross* station, No. 5088; 35° 11′ 25″ north latitude, 139° 28′ 20″ east longitude (Sagami Bay, southern Japan); 369–405 fathoms; October 25, 1906.

20. ANTEDON ALBOFLAVA, new species.

Centro-dorsal hemispherical or bluntly conical, bearing about 15 cirri; cirri 20 mm. long with 30 short joints, only a very few of which are longer than wide, the sixth and following with sharp dorsal spines.

First radials visible as paired interradial tubercles, sometimes as a very narrow band below the second radials; second radials short, deeply incised by the axillaries, strongly carinate; axillaries over twice as wide as high, with a pronounced median keel. Thirteen to 15 arms, 65 mm. long, of about 110 joints; first 8 or 9 brachials oblong, then triangular, about as long as wide, the distal brachials overlapping; a pronounced median keel on the first two brachials; distichals two, resembling the two outer radials and, like them, strongly carinate.

First pinnule 6 mm. long with 12 squarish joints, flattened exteriorly; following pinnules successively shorter to the fifth or sixth, which is 3 mm. long with 7 short joints, then becoming gradually longer again distally, where the pinnules are 8 mm. long with 17 or 18 rather short joints.

Color in life light yellow, banded with white; cirri white.

Type.—Cat. No. 22634, U.S.N.M.; from *Albatross* station, No. 4936; 30° 54′ 40″ north latitude, 130° 37′ 30″ east longitude (off Kagoshima Gulf); 103 fathoms; August 16, 1906.

21. ANTEDON RUBER, new species.

Centro-dorsal low, bearing about 30 cirri in 15 vertical rows; cirri 11 mm. long with about 30 joints, the first 8 longer than wide, the others short, sharply carinate distally, but without distinct dorsal spines.

First radials narrow and crescentic, in apposition laterally; second radials about twice as wide as high, oblong; axillaries pentagonal, nearly as high as wide. Ten arms 35 mm. long, the first five brachials nearly oblong, then quadrate, becoming elongated toward the ends of the arms; syzygies in the third, and seventh–tenth brachials, and about every other joint distally.

First pinnule on second brachial, 4 mm. long, with 12 joints, the distal ends raised and serrate or spinous; the third brachial has no pinnule, the second, third, and fourth pinnules are of the same character as the first, but gradually decrease in length; distal pinnules 6 mm. long with about 12 joints, slightly expanded at their junctions.

The disk of this species is well plated in the areas between the arms; the anal tube is about three times the diameter of the disk in length, reaching to the fifteenth brachial.

Color in life salmon red, the pinnules yellow, the cirri white.

Type.—Cat. No. 22643, U.S.N.M.; from *Albatross* station, No. 4894; 32° 33′ 00″ north latitude, 128° 32′ 10″ east longitude (Korean Straits); 95 fathoms; August 9, 1906.

22. ANTEDON DIOMEDEÆ, new species.

Centro-dorsal small, rounded-conical (rarely long conical) bearing 30–40 slender cirri in 15 closely set vertical rows; cirri 30 mm. long, slender, with about 40 joints, the basal half elongate, the distal short, developing strong dorsal spines.

First radials oblong, about twice as wide as high, in apposition all around; second radials similar, but rather higher, and well separated; axillaries about as wide as high, with an extravagantly elongated conical tubercle on the junction of the second radial and axillary. Ten arms, 70 mm. in length, with about 70 joints, at first irregularly oblong, then quadrate, becoming elongate distally; there is another long tubercle on the junction of the first two brachials. Syzygies occur in the third, eighth, and twelfth brachials, and distally at intervals of 3 joints.

The third brachial bears no pinnule; the pinnule on the second brachial is 7 mm. long, moderately stout, with about 12 joints, roughly twice as long as wide; the pinnule on the fourth brachial (second pinnule) is similar, and about the same size, usually slightly shorter, rarely somewhat longer; the next few pinnules decrease in length, the distal pinnules becoming longer again and very slender, with about 20 elongated joints.

Color in life rich reddish purple, spotted and blotched with white; the radials and lower brachials are white, the tubercles purple, the radials with narrow purple transverse lines; cirri white, banded with purple. Younger examples are lighter in color, very small ones being nearly all white.

Type.—Cat. No. 22640, U.S.N.M.; from *Albatross* station No. 4947; 31° 28′ 20″ north latitude; 130° 35′ 30″ east longitude (off the southern shore of Nipon); 51 fathoms; August 20, 1906.

23. ANTEDON TIGRINA, new species.

Centro-dorsal discoidal, much smaller than the disk, bearing 25–30 marginal cirri in a single irregular row; the cirri are 10 mm. long, with about 20 short joints, of which the distal half bear small paired spines, which become single near the tip.

First radials concealed, or barely visible; second radials over twice as wide as high, oblong, well separated laterally; axillaries pentagonal, a low, rounded tubercle at the junction of the axillary and second radial. Ten arms, reaching 50 mm. in length in the largest specimen; first 6 brachials oblong (except the third, which is almost square) about twice as wide as high; the next two or three quadrate, the following triangular, becoming quadrate and elongate distally; distal edges of brachials finely serrate, and turned outward and slightly backward; syzygies in the third, eighth, and twefth brachials, and distally at intervals of 4–9 joints.

First pinnule (on second brachial) about 5 mm. long, slender, with 13 joints, the first 3 or 4 squarish, the others longer than wide; the third brachial has no pinnule; second pinnule (on fourth brachial) about 10 mm. long, with 20 joints, the first 2 about as long as wide, the others elongated; following 3 or 4 pinnules decrease rapidly in length; the distal pinnules are 9 or 10 mm. long, slender, with 20–25 joints, not greatly elongated; the joints of the lower pinnules are slightly expanded distally, with finely serrate margins; the first 5 or 6 pairs of pinnules are very stiff.

Color (in spirits) whitish, the brachials broadly edged with deep reddish brown; radials and first 6 or 7 brachials purple, with a median band of white; lower pinnules white, purple, or banded, the distal pinnules usually purplish or reddish brown; cirri light purplish.

Type.—Cat. No. 22642, U.S.N.M.; ? Kagoshima Bay, Japan; the 19 specimens of this species were obtained by the United States North

Pacific Exploring Expedition, under Capt. John Rodgers, U. S. Navy, and are labeled "Kagoshima Bay;" but there appears to be some doubt as to whether they really were obtained there.[a]

24. ANTEDON BOWERSI [b] new species.

Centro-dorsal conical, bearing about 30 cirri in 15 closely set vertical rows; the cirri are 13 mm. in length, with 30 joints, of which only about the first 7 are longer than wide; the distal joints do not bear spines.

First radials just visible, in apposition all around; second radials oblong, short, and wide, well separated; axillaries pentagonal, wider than high. Ten arms, 40 mm. long, the first 5 brachials oblong, then quadrate, becoming elongate distally; syzygies in the third, eighth, and twelfth brachials, and distally at intervals of 1 or 2 joints.

First pinnule (on second brachial) the largest, 4 mm. long, stiff, with 10 elongated joints; second pinnule (on fourth brachial) similar, but shorter, and rather less stout; following pinnules more slender, and increasing in length to about 6.5 mm., with 15 joints, the first 2 expanded and trapezoidal, the others elongated.

Color in life brownish yellow, the skeleton and cirri nearly white.

Type.—Cat. No. 22641, U.S.N.M.; from *Albatross* station No. 4934; 30° 58′ 30″ north latitude; 130° 32′ 00″ east longitude (off Kagoshima Gulf); 152–103 fathoms; August 16, 1906.

25. ANTEDON ABBOTTI,[c] new species.

Centro-dorsal saucer-shaped, with 15 marginal cirri; these are 23 mm. long, stout, with 40–45 short joints, the distal bearing a small, low tubercle dorsally.

First radials just visible, the distal corners free; second radials about twice as wide as long, bearing distally on the lateral edges small tubercules; axillaries pentagonal, rather long, also with lateral tubercles; distichals 2, like the outer radials, but first distichals in apposition for almost their entire length; the distichals and the first brachials have lateral tubercules; no further arm division. Twenty arms 100 mm. long, the first 8 or 9 brachials oblong, then quadrate, soon becoming triangular, about as wide as high; a syzygy in the third brachial; in the arms having an additional syzygy it is in the forty-first (twice), forty-second, forty-fourth, forty-seventh, fifty-fourth, and ninetieth brachials, respectively.

The disk is very deeply incised.

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[a] Since the description of *Antedon tigrina* was put in type I have examined several specimens of the species taken in Sagami Bay in 1900, so I have no doubt that the originals really did come from Japan.

[b] For the Hon. George M. Bowers, the Commissioner of Fish and Fisheries.

[c] For Dr. W. L. Abbott, to whom we are indebted for much of our knowledge regarding the fauna of the Indo-Malayan region.

First pinnule 5 mm. long, with 20 squarish joints, tapering evenly from the base; second pinnule 12 mm. long, very stout, with 20 short joints; following pinnules rather smaller than the first, becoming elongate distally.

Color (in spirits) dark purplish brown, cirri and second pair of pinnules lighter and yellowish.

Type.—Cat. No. 22644, U.S.N.M.; from Pulo Taya, China Sea; obtained in July, 1899, by Dr. W. L. Abbott.

26. ANTEDON STYLIFER, new species.

Centro-dorsal hemispherical, bare at the pole, with 30 cirri; cirri 20 mm. long, with 30 joints, very slightly longer than wide, remarkably uniform in size; there are no dorsal nor opposing spines.

First radials just visible; the second short, in close contact laterally, and less than half the height of the irregularly rhombic axillary; first distichal oblong, about two and one-half times as wide as high, the axillary triangular, about half as high as wide; the junction between the 2 outer radials and the 2 distichals is elevated into a low tubercle; the radials, distichals, and first brachials are in close contact laterally. Nineteen arms 70 mm. long, with about 150 joints, the first 8 oblong, then triangular (much wider than high) to the fortieth brachial, after which they become irregularly oblong; syzygies in the third brachials, again about the twelfth, and distally at intervals of about 4 joints; the lower brachials are slightly tubercular, and all the brachials have slightly overlapping edges.

First pinnule 8 mm. long, rather slender, with 16 moderately elongated joints; second pinnule 11 mm. long, with 17 joints, stouter than the first; third pinnule 15 mm. long, stout, stiff, and rigid, with 16 long cylindrical joints; this pinnule is much stouter and stiffer than any of the others; fourth pinnule 10 mm. long, fifth 7 mm. long; distal pinnules 8 mm. long, with about 20 joints, tapering gradually from the base to the point.

Color in life purple, the skeleton and cirri light brownish yellow.

Type.—Cat. No. 22645, U.S.N.M.; from *Albatross* station No. 4929; 30° 12′ 30″ north latitude, 130° 43′ 00″ east longitude (Eastern Sea); 84 fathoms; August 15, 1906.

27. ANTEDON DELICATISSIMA, new species.

Centro-dorsal low-hemispherical, a large area at the pole bare, bearing about 30 marginal cirri; these are 30 mm. long, with 40 joints, much elongated basally, short distally, none of them bearing dorsal spines.

Disk naked, deeply incised, the anal tube greatly elongated (9 mm. in length), the anal interambulacrum being much larger than the others, the mouth subcentral.

First radials concealed; second radials short, in lateral contact for the basal half; axillaries low-pentagonal, well separated laterally; distichals and palmars 2, articulated (the latter developed on the outer side of the rays only), resembling the two outer radials, but longer in proportion to the width. Twenty-eight arms 70 mm. long, the first 10 brachials oblong, then short-quadrate, becoming oblong again distally; syzygies in the third (sometimes the second) brachials, again about the fourteenth to twentieth, and distally at intervals of 3–5 joints.

First pinnule short, 5 mm. in length, with 15 short joints; second pinnule longer; third pinnule much the longest, 11 mm. long, with about 20 elongated cylindrical joints; succeeding pinnules short, becoming long and slender distally.

Color in life light purplish gray, the skeleton yellowish white, with a narrow purple median line.

Type.—Cat. No. 22646, U.S.N.M.; from *Albatross* station No. 4930; 30° 12′ 00″ north latitude, 130° 44′ 00″ east longitude (Eastern Sea); 84 fathoms; August 15, 1906.

This species comes nearest to *Antedon bimaculata* P. H. Carpenter, from which it differs in its elongate cirri, with nearly double the number of joints, the short intersygial interval and the more proximal position of the second syzygy, the proportions of the lower pinnules, and the less number of arms.

The color of *A. bimaculata* is probably quite unreliable as a specific character, for of the 80 specimens I have at hand of *A. manca* one is colored exactly as described for *A. bimaculata*, although all the others are quite different. *A. delicatissima* in color agrees most nearly with certain specimens of *A. multicolor*.

28. ANTEDON RUBROFLAVA, new species.

Centro-dorsal discoidal, broad, slightly concave on the dorsal surface, bearing 35–40 very stout cirri in two marginal rows; the cirri have 15–20 joints, stout, about as wide as long, which exhibit a slight tendency to overlap ventrally, but do not bear dorsal spines; the joints are somewhat compressed and are constricted in the middle, thus giving especial prominence to the articulations; the penultimate joint is furnished with an opposing spine.

First radials concealed; second radials partially concealed; axillaries pentagonal, wider than high, with a syzygy; distichals 3, the axillary a syzygy. Eleven arms 180 mm. long, with 260 or more joints, the first 8 or 9 brachials nearly oblong, becoming distally triangular, all the brachials with overlapping edges, furnished with two or more rows of very fine teeth; there is a slight rounded tubercle on the junction of the first two brachials; syzygies occur in the third brachial, again about the eighth or ninth, and usually in the twelfth or thirteenth, with others distally at intervals of 5–7 joints in the proximal part of the arm and 3 joints toward the tip.

The first pinnule is on the second distichal and resembles that on the second brachial; pinnule on second brachial 8 mm. long, of about 28 joints, flagellate, the second to the fourth joint furnished with large dorsal keels; the pinnule on the fourth brachial is 11–15 mm. long, with 35–40 joints, flagellate, the first 2 or 3 joints with a dorsal keel; the pinnule on the sixth brachial is 12–16 mm. long, with about 40 joints; that on the eighth is about the same, that on the tenth slightly shorter, like that on the twelfth; from this point the pinnules gradually decrease in length and become more slender, the joints much more elongate; the pinnule on the fortieth brachial is 9 mm. long, with 23 long and very slender joints.

The color in life is brilliant yellow, the arms broadly banded with bright red; the cirri are dull orange red.

Type.—Cat. No. 22639, U.S.N.M.; from *Albatross* station No. 4880; 34° 16′ 00″ north latitude, 130° 16′ 00″ east longitude (Korean Straits); 59 fathoms; August 2, 1906.

This species is readily distinguishable from *A. hartlaubi* by having fewer arms, which are longer and more slender, by having the second radials visible, and by the character of the cirri, which are more numerous, stouter, with shorter joints, and with a prominent opposing spine on the penultimate. The very brilliant and unusual coloration may be a good specific character.

29. ANTEDON THETIS, new species.

Centro-dorsal discoidal, bearing about 12 marginal cirri; these are about 10 mm. long, with 25 to 30 joints, of which the fourth, fifth, and sixth are squarish; the others wider than long, developing prominent spines distally.

First radials very short; but laterally they are in apposition, forming a large interradial triangle, produced anteriorly, separating the second radials; second radials rather short, trapezoidal; axillaries pentagonal, less than twice as wide as high; the second radials and axillaries are rounded laterally, and widely separated. Ten arms 30 mm. long; the first brachials on each arm in close apposition for their entire length, roughly oblong; second brachials squarish, strongly convex exteriorly; third brachials longer than wide, constricted in the middle; following 2 or 3 brachials quadrate, then becoming triangular, longer than wide, the outer side convex, becoming elongate and quadrate distally.

First pinnule small, short, and weak, with about 25 squarish joints;

the first joint is enormously expanded laterally, the second intermediate between it and the other joints; second pinnule greatly elongated, stiff, and spinelike, with 15 elongated joints; third pinnule usually shorter, but similar in character; following pinnules decrease in length, becoming somewhat longer distally. Pinnule ambulacra plated.

Color (in spirits) light purple, banded with dull yellow; cirri purple, banded with white.

Type.—Cat. No. 22654, U.S.N.M.; from *Albatross* station, No. 3744; Suno Saki bearing east, 8.83 miles distant (off Nipon, Japan); 46 fathoms; May 19, 1900.

This species belongs to the Acœla group, but is readily distinguished from the other 10-armed species by having the second radials separated by a forward projection from the first radials, as in *A. multicolor*, combined with the lack of any lateral processes on the radials.

30. ANTEDON HAWAIIENSIS, new species.

Centro-dorsal large, hemispherical or short columnar, with 5 well-separated double rows of cirri, usually about 20 cirri in all; these are 32 mm. long, rather slender, with 50 to 55 short joints, the fourth to the eighth rather longer than wide, the others wider than long; from the tenth onward dorsal spines are developed which are long and prominent.

Basals sometimes just visible; first radials just visible, crescentic; second radials very short; axillaries about one and one-half times as wide as long. The radials and first (sometimes, also, the second) brachials (or first and second distichals, when present) fringed with numerous rather long, stout spines; there may be also a few scattered spines on their dorsal surface. Distichals, when present, 4 (3+4). Ten to 12 arms 110 mm. long, the first 6 brachials oblong, wider than long, then triangular, about as long as wide; distally the arms are compressed, and the brachials develop long, curved, overlapping spines, as in *A. spinifera*. A syzygy in the third (or, after a distichal series, the first) brachial, another at about the twentieth, and distally at intervals of from two to four joints.

First pinnule the longest, very stout, flattened exteriorly, with about 12 joints, tapering rapidly after the seventh or eighth; second and following pinnules much more slender, shorter, with fewer joints but slightly longer than wide; the distal pinnules are somewhat elongated, with elongate joints, except the first two, which are short, somewhat expanded, and trapezoidal.

Color (in spirits) white, the radials, distichals, and lower brachials dusky.

Type.—Cat. No. 22653, U.S.N.M.; from *Albatross* station, No. 3475; 21° 08′ 00″ north latitude, 157° 43′ 00″ west longitude (Hawaiian Islands); 351 fathoms; December 6, 1891.

31. COMATULA MARIÆ,[a] new species.

Centro-dorsal discoidal, 9 mm. in diameter, bearing about 30 marginal cirri in two irregular rows; cirri 25 mm. long, moderately stout, with 27 to 30 joints, the proximal half of which are somewhat longer than wide, the distal half short; from the sixth joint the distal dorsal edge begins to project, forming prominent broad dorsal spines on the distal two-thirds of the cirrus.

First radial concealed; second radials rather short, very broad, in apposition laterally; axillaries more than twice as broad as long, free laterally. Twenty-six arms, 160 mm. long. The distichal and palmar series in this species are quite unique, no other previously described form at all approaching it in irregularity. There are 9 distichal series present, 3 consisting of an axillary only, 1 of 2 joints united by syzygy, 4 of 2 articulated joints, and 1 of 4 joints, the 2 outermost united by syzygy. Of the 7 palmar series, 3 are of 3 joints, the 2 outer united by syzygy, 2 are of 2 joints united by syzygy, 1 is of 2 articulated joints and 1 is of 4 joints, the 2 outer united by syzygy. The first arm syzygy is usually in the second brachial, but often in the first; sometimes both the first and second are syzygies, while again there may be none until the third. Succeeding syzygies are quite irregular; the second may be anywhere from the sixteenth to the fortieth brachial, and the distal intersyzygial interval anywhere from 7 to 22 or more joints. The arms are slender, remarkably uniform in width; the first 5 to 7 brachials are oblong, then triangular about twice as wide as long, becoming short and discoidal in the distal half of the arm; all the brachials overlap somewhat, the distal edges being finely serrate.

The lower pair or two of pinnules are 20 mm. long, and slender, the lower 5 or 6 joints the largest, but not especially enlarged. The following pinnules decrease rapidly in length to about the sixth pair; the following 4 or 5 pairs of pinnules are comparatively stout, with the 4 or 5 basal joints enlarged somewhat, after which the pinnules become more elongated. The distal edges of all the pinnule joints are everted, prominent, and serrate.

Color in life brownish yellow, the pinnules grayish.

Type.—Cat. No. 22655, U.S.N.M.; from *Albatross* station, No. 4880; 34° 16′ 00″ north latitude, 130° 16′ 00″ east longitude (near the Oki Islands, Sea of Japan); 59 fathoms; August 2, 1906.

32. COMATULA SOLASTER, new species.

Centro-dorsal large, flat, and discoidal, bearing about 20 cirri in a single marginal row; these have about 20 or 21 (rarely more, though sometimes as many as 30) joints, the third to the seventh much elongated, the others shorter than broad, the distal bearing low spines. The cirri are moderately stout, resembling those of *C. japonica.*

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[a] For Mrs. Mary W. Clark, of Boston, who has been of great assistance to me in my work on the unstalked crinoids.

Radials usually concealed as far as the axillary. Axillaries triangular, over twice as broad as long. Distichals and palmars 4 (3 + 4), in close apposition, and flattened, as in the Basicurva group of Antedon. In some places the distichals are separated enough to make room for the dorsal keel of the much flattened distichal pinnule, but the perisome is never visible from the dorsal surface. Twenty to 30 arms, very stout, tapering rather rapidly, the brachials quadrate, very short, and strongly overlapping. Lower pinnules not especially large, but greatly compressed and very strongly carinate for the basal 8 to 12 joints. This carination decreases in degree after the first 3 or 4 pairs of pinnules, but is evident even on the distal pinnules. The pinnules (except for the first few pairs) have their joints overlapping and finely spinous.

Color in life dark purple, the disk, cirri, and pinnules brownish yellow.

Type.—Cat. No. 22656, U.S.N.M.; from *Albatross* station No. 4944; 31° 38′ 15″ north latitude, 130° 46′ 50″ east longitude (in Kagoshima Gulf); 43 fathoms; August 17, 1906.

This species is readily distinguished by its very massive radials and distichals, which form a solid cup, so that none of the perisome is perceptible from the dorsal side; very small specimens show that this character is assumed at an early period of growth. In the adults the radials and distichals are so closely welded together that it becomes difficult to trace the sutures.

33. COMATULA SERRATA, new species

Centro-dorsal a thick, flat, pentagonal disk with about 15 marginal cirri in two irregular rows; the cirri are small, with 10 joints, the third and fourth much elongated, becoming rapidly shorter distally. The terminal 7 joints bear small dorsal spines, that on the penultimate being the largest; terminal claw rather long.

First and most of the second radials concealed; two outer radials united by syzygy; distichals 4 (3+4); rarely 2 (1+2); rays separated from the second radial; first brachials closely united interiorly, the second brachials free; first two brachials united by syzygy. First three brachials oblong, then quadrate, becoming triangular, about as wide as long after the seventh; the radials, distichals, palmars, and brachials all have everted and serrate edges; in the only arm remaining the ninth, twelfth, fifteenth, eighteenth, and twenty-first brachials are syzygies. The pinnule joints have strongly spinous distal edges.

Color in life dull greenish yellow.

Type.—Cat. No. 22657, U.S.N.M.; from *Albatross* station No. 4895; 32° 33′ 10″ north latitude, 128° 32′ 10″ east longitude (southern part of the Sea of Japan); 95 fathoms; August 9, 1906.

Another specimen, from station No. 4893, is somewhat smaller, but otherwise agrees perfectly with the type. One of the rays, however, has the distichal series of only two joints, united by syzygy, like the palmars; neither of the specimens has the disk in position.

34. COMATULA ORIENTALIS, new name.

In the *Challenger*[a] report on the Comatulæ Dr. P. Herbert Carpenter gave the name *Actinometra simplex* to a curious little species from the Admiralty Islands; in 1881, however,[b] he stated that in the Paris Museum he found specimens of *Comatula parvicirra* bearing the name of *C. simplex*. He mentioned certain peculiarities of these specimens, showing how they differ from Müller's original description of *Alecto parvicirra*, thus making it clear that they can not belong to the *Challenger* species to which he gave the name *Actinometra simplex*. As the two are congeneric, however, it becomes necessary to designate the species described in the *Challenger* report by a new name, and for it I propose the name *Comatula orientalis*.

35. ATELECRINUS POURTALESI,[c] new name.

In 1869,[d] L. F. de Pourtalès described *Antedon cubensis* from two specimens dredged in 450 fathoms off Cojima, near Habana, Cuba; but his description is applicable only to the larger and more perfect specimen. Although later he seems to have suspected that the two were different, he never gave a name to the smaller form.

In 1881[e] Doctor Carpenter, in his preliminary report on the Comatulidæ collected by the United States Survey Steamer *Blake*, showed that the smaller specimen was not only specifically but generically distinct from the larger one, and he proposed the genus *Atelecrinus* for it and an allied form, also from Cuba, which he called *Atelecrinus cubensis* and *Atelecrinus balanoides*, respectively. The name *cubensis* he credits to Pourtalès, saying that the species "may retain the name *cubensis*, originally conferred upon it by Mr. Pourtalès." But, although the *Antedon cubensis* was a composite species, the type specimen is clearly indicated in the the original description, and it is quite a different thing from *Atelecrinus cubensis* of Carpenter, belonging to a different genus.

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[a] Challenger Reports, Zoology, XXVI, p. 312.

[b] Notes from the Leyden Museum, III, p. 20[illegible].

[c] For the late L. F. de Pourtalès, to whom we owe much of our knowledge respecting the crinoid fauna of the Caribbean Sea.

[d] Bull. Mus. Comp. Zool., I, No. 11, p. 356.

[e] Bull. Mus. Comp. Zool., IX, No. 4, p. 166.

Now, Doctor Carpenter has restricted the use of *Antedon cubensis* to the smaller of the two original specimens described by Pourtalès, while Pourtalès himself indicated the larger as the type of the species; the name can not, of course, be applicable to both, and must stand for the species represented by the larger specimen. As this leaves the species called by Doctor Carpenter *Atelecrinus cubensis* (Pourtalès) without a name, I propose that it be known as *Atelecrinus pourtalesi.*